⁶⁰Ni(n,γ),(pol n,γ) E=thermal 2004Ra23,1993Ha05,1972Ko15

History					
Туре	Author	Citation	Literature Cutoff Date		
Full Evaluation	Balraj Singh	ENSDF	20-Jan-2020		

No changes made since the 2015 update, except for S(n) from 2017Wa10.

2004Ra23: E=thermal. Measured $E\gamma$, $I\gamma$, $\gamma\gamma$ with a coaxial intrinsic Ge detector positioned inside a NaI(Tl) annulus. This Ge detector was operated either in the Compton-suppressed mode or in the pair-spectrometer mode.

1993Ha05,1993HaZV: measured $E\gamma$, $I\gamma$, Compton suppression and pair spectrometer, enriched target.

1972Ko15: measured E γ , I γ , CP(γ), semi, enriched target.

2007ChZX: PGNAA project, 36 secondary and 15 primary γ rays were reported in the measurements at Budapest .

1992Ku17: reanalysis of the data from 1991Ul01 with molecular dynamics simulations and an improved interatomic potential. 1991Ul01: measured lifetime by the γ -ray induced Doppler (GRID) method in thermal neutron capture.

Others: 1997Ve03, 1977Is01, 1970GaZQ, 1975Wi06, 1967Ba79, 1964Co13, 1964Za02.

All data are from 2004Ra23, unless otherwise indicated.

⁶¹Ni Levels

E(level) [†]	\mathbf{J}^{π}	T _{1/2} ‡
0.0	3/2-	
67.41 [#] 3	5/2-	
282.973 21	1/2 ^{-b}	
656.039 [#] 22	$1/2^{-}$	
908.59 [#] 3	5/2-	
1015.32 [#] 9	7/2-	
1099.684 [#] 22	3/2 ^{-b}	0.18 ps 8
1132.41 <i>3</i>	5/2-	
1185.301 [#] 22	3/2 ^{-b}	
1454.84 [#] 11	7/2-	
1609.80 [#] 5	$5/2^{-}$	
1729.63 [#] 3	3/2-	
1998.12 7	5/2-	
2123.949 [#] 19	1/2 ^{-b}	51 fs 10
2639.51 5	1/2-,3/2-	
2707.63 [#] 9		
2765.03# 7	3/2-	
2862.94 9	1/2, $3/2$	
3002.10 3	1/2	
3231 67 4	$1/2^{-} 3/2^{-}$	
3415.14 4	$1/2^{-}, 3/2^{-}$	
3525.60 [#] 8		
3668.99 [#] 4	$1/2^{-}, 3/2^{-}$	
3711.49 6	1/2-,3/2-	
3738.34 [@] 18	$(1/2^+)$	
3776.80 9	$(1/2^-, 3/2^-)$	
3869.99 7		
4178.90 14		
4239.76 [#] 5		
4439 88 [#] 13		
4514.69 13		

⁶⁰Ni(n,γ),(pol n,γ) E=thermal 2004Ra23,1993Ha05,1972Ko15 (continued)

⁶¹Ni Levels (continued)

E(level) [†]	J^{π}	Comments
4713.08? ^{&} 8 4793.12 <i>16</i> 5036.24 [@] 9 5116.61 [@] <i>17</i> 5390.85 <i>14</i>	1/2-,3/2-	
5955.52 [#] 17 6575.70 18 6615.8 3 (7820.113 ^{#a} 21)	1/2+	E(level): S(n)=7820.10 5 (2017Wa10).
[†] From least-squ	ares fit to E	γ data.

[‡] From 1991Ul01 using the grid method.

[#] Intensity imbalance $[I_{\gamma}(in)-I_{\gamma}(out)]$ at this level is negative.

[@] Intensity imbalance $[I_{\gamma}(in) - I_{\gamma}(out)]$ at this level is positive.

& E(level): from 1993Ha05, only 4714.2 7 γ observed in 2004Ra23 is unplaced.

^a E(level): 7020.113 in Table XVI of 2004Ra23 is a misprint. S(n)=7820.10 5 (2017Wa10).

^b From 1972Ko15 measured circular polarization of γ -rays in ⁶⁰Ni(pol n, γ) reaction.

$\gamma(^{61}\text{Ni})$

I γ normalization: σ =2.34 b 5 (2004Ra23). The intensities listed by 2004Ra23 are in units of millibarns. To obtain intensities per 100 neutron captures, multiply by 0.0427.

$I_{\gamma}^{\dagger h}$	E _i (level)	\mathbf{J}_i^{π}	E_f	\mathbf{J}_f^{π}
32.9 6	67.41	5/2-	0.0	3/2-
0.18 <i>3</i>				
0.64 5	1099.684	3/2-	908.59	5/2-
0.38 <i>3</i>	282.973	$1/2^{-}$	67.41	$5/2^{-}$
0.37 6	1185.301	$3/2^{-}$	908.59	$5/2^{-}$
812 27	282.973	$1/2^{-}$	0.0	3/2-
0.29 3				
4.27 5	656.039	$1/2^{-}$	282.973	$1/2^{-}$
1.77 6	2123.949	$1/2^{-}$	1729.63	3/2-
0.34 7	1609.80	5/2-	1132.41	5/2-
0.69 8	2123.949	$1/2^{-}$	1609.80	5/2-
5.37 6	1185.301	3/2-	656.039	$1/2^{-}$
0.14 4	1454.84	7/2-	908.59	5/2-
2.33 5	656.039	$1/2^{-}$	67.41	5/2-
0.30 5	908.59	5/2-	282.973	$1/2^{-}$
0.20 4	1729.63	3/2-	1099.684	3/2-
0.20 6	3415.14	1/2-,3/2-	2765.03	3/2-
0.50 11				
20.39 22	656.039	$1/2^{-}$	0.0	3/2-
0.61 5	1609.80	$5/2^{-}$	908.59	$5/2^{-}$
0.21 4				
0.19 6	3668.99	1/2-,3/2-	2862.94	1/2-,3/2-
38.7 4	1099.684	3/2-	282.973	$1/2^{-}$
0.87 6	1729.63	3/2-	908.59	5/2-
	$\begin{array}{r} {\scriptstyle \rm I_{\gamma}}^{\dagger h} \\ \hline 32.9\ 6 \\ 0.18\ 3 \\ 0.64\ 5 \\ 0.38\ 3 \\ 0.37\ 6 \\ 812\ 27 \\ 0.29\ 3 \\ 4.27\ 5 \\ 1.77\ 6 \\ 0.34\ 7 \\ 0.69\ 8 \\ 5.37\ 6 \\ 0.14\ 4 \\ 2.33\ 5 \\ 0.30\ 5 \\ 0.20\ 4 \\ 0.20\ 6 \\ 0.50\ 11 \\ 20.39\ 22 \\ 0.61\ 5 \\ 0.21\ 4 \\ 0.19\ 6 \\ 38.7\ 4 \\ 0.87\ 6 \\ \end{array}$	$\begin{array}{c c} I_{\gamma}^{\dagger h} & E_i(\text{level}) \\\hline 32.9 \ 6} & 67.41 \\\hline 0.18 \ 3} \\\hline 0.64 \ 5 & 1099.684 \\\hline 0.38 \ 3 & 282.973 \\\hline 0.37 \ 6 & 1185.301 \\812 \ 27 & 282.973 \\\hline 0.29 \ 3 & 4.27 \ 5 & 656.039 \\\hline 1.77 \ 6 & 2123.949 \\\hline 0.34 \ 7 & 1609.80 \\\hline 0.69 \ 8 & 2123.949 \\\hline 5.37 \ 6 & 1185.301 \\\hline 0.14 \ 4 & 1454.84 \\\hline 2.33 \ 5 & 656.039 \\\hline 0.30 \ 5 & 908.59 \\\hline 0.20 \ 6 & 3415.14 \\\hline 0.50 \ 11 \\\hline 20.39 \ 22 & 656.039 \\\hline 0.61 \ 5 & 1609.80 \\\hline 0.21 \ 4 & 0.19 \ 6 & 3668.99 \\\hline 38.7 \ 4 & 1099.684 \\\hline 0.87 \ 6 & 1729.63 \\\hline \end{array}$	$\begin{array}{c cccc} I_{\gamma}^{\dagger h} & E_i(\text{level}) & J_i^{\pi} \\ \hline 32.9.6 & 67.41 & 5/2^- \\ 0.18.3 & 0.64.5 & 1099.684 & 3/2^- \\ 0.38.3 & 282.973 & 1/2^- \\ 0.37.6 & 1185.301 & 3/2^- \\ 812.27 & 282.973 & 1/2^- \\ 0.29.3 & 4.27.5 & 656.039 & 1/2^- \\ 1.77.6 & 2123.949 & 1/2^- \\ 0.34.7 & 1609.80 & 5/2^- \\ 0.69.8 & 2123.949 & 1/2^- \\ 5.37.6 & 1185.301 & 3/2^- \\ 0.14.4 & 1454.84 & 7/2^- \\ 2.33.5 & 656.039 & 1/2^- \\ 0.30.5 & 908.59 & 5/2^- \\ 0.20.4 & 1729.63 & 3/2^- \\ 0.20.6 & 3415.14 & 1/2^-, 3/2^- \\ 0.50.11 & 2\\ 0.39.22 & 656.039 & 1/2^- \\ 0.50.11 & 2\\ 0.39.22 & 656.039 & 1/2^- \\ 0.50.11 & 2\\ 0.39.22 & 656.039 & 1/2^- \\ 0.50.11 & 2\\ 0.39.22 & 656.039 & 1/2^- \\ 0.50.11 & 2\\ 0.39.22 & 656.039 & 1/2^- \\ 0.50.11 & 2\\ 0.39.22 & 656.039 & 1/2^- \\ 0.50.11 & 2\\ 0.39.22 & 656.039 & 1/2^- \\ 0.50.11 & 2\\ 0.39.22 & 656.039 & 1/2^- \\ 0.50.11 & 2\\ 0.39.22 & 656.039 & 1/2^- \\ 0.50.11 & 2\\ 0.39.22 & 656.039 & 1/2^- \\ 0.50.11 & 2\\ 0.39.22 & 656.039 & 1/2^- \\ 0.50.11 & 2\\ 0.50$	$\begin{array}{c c c c c c c c c c c c c c c c c c c $

⁶⁰ Ni(\mathbf{n}, γ),(pol \mathbf{n}, γ) E=thermal	2004Ra23,1993Ha05,1972Ko15 (continued)

				$\gamma(^{\circ}$	¹ N1) (continued)
F	т † <i>h</i>	F.(level)	īπ	E.	Iπ
	1.46.7		<i>j_i</i>		<u> </u>
841.2 1	1.46 /	908.59	5/2	67.41	5/2
848.54 <i>13</i>	0.58 5	3/11.49	1/2 ,3/2	2862.94	1/2 ,3/2
*888.0 3	0.23 5				
~900.2 3	0.26 5	1105 201	2/2-	292.072	1/2-
902.27 /	1.27 5	1185.301	3/2 5/2-	282.973	1/2
908.59 4	16 09 17	908.59	5/2	0.0	3/2
938.02 4	10.28 17	2125.949	1/2	1185.301	5/2 5/2
947.90 9	0.82 0	1015.32	1/2	67.41	5/2
x090.91.25	0.30 5				
	0.24 5	1009 12	5/2-	1015 22	7/2-
982.0 4 X008 0 4	0.14 5	1998.12	5/2	1015.52	1/2
1015 28 24	0.14 5	1015 22	7/2-	0.0	2/2-
1013.28 24	0.29 0	2144.08	112	0.0	$\frac{3}{2}$
1021.00 8	0.93 0	3144.96	1/2-	2125.949	1/2 $2/2^{-}$
1024.27 /	1.22 0	2123.949	$\frac{1}{2}$	67.41	3/2 5/2-
1032.23 4 X1020 9 2	0.00 9	1099.084	5/2	07.41	5/2
1039.8 3	0.20 J 3 20 K	1132 41	5/2-	67 41	5/2-
1003.01 3	5.29 0 1 95 6	1132.41	3/2 2/2-	0/.41	$\frac{J}{2}$
1073.52 0	1.85 0	1/29.03	5/2 5/2-	000.039	1/2
1089.03 22	0.370	1998.12	3/2	908.39	$\frac{3}{2}$
1099.07 4	27.0 3	1099.084	$\frac{3}{2}$	2122.040	$\frac{3}{2}$
1107.71 9	0.08 0	3231.07 4178 00	1/2 ,3/2	2123.949	1/2 $1/2^+$
1110.40 25	0.42 0	41/0.90	2/2-	67.41	1/2 5/2 ⁻
1110 1	0.09 8	1105.501	5/2 5/2-	07.41	$\frac{3}{2}$
1132.40 4	J.69 9 0.60 7	2144.09	5/2	1008 12	5/2 5/2-
1140.09 10	0.09 7	2765.02	2/2-	1998.12	5/2 5/2-
1134.9 3	0.41 0 52 6 6	2705.05	3/2	1009.80	3/2
1163.29 4 x1100 10 12	52.00	1185.501	5/2	0.0	5/2
$x_{1100.10} 12$	0.477				
1195.5 4	0.24 0	(7920 112)	1/2+	6615 0	
1204.2 5	0.28 5	(7820.113)	$\frac{1}{2}$	0013.8	5/2-
1213.35 5	2.00 0	2123.343	$\frac{1}{2}$ $\frac{1}{2^{-2}}$	1008 12	5/2-
1233.4 3	0.427	(7820 113)	1/2, 3/2 $1/2^+$	1990.12 6575 70	5/2
1244.39 10	0.57 7	(7820.113)	$\frac{1}{2}$ $\frac{1}{2^{-}}$ $\frac{3}{2^{-}}$	1600.80	5/2-
1255.25 20 x1315 2 A	0.37 7	2002.94	1/2 ,3/2	1009.80	5/2
1313.24	0.20 5	1998 12	5/2-	656 030	1/2-
10720^{+}	0.20 0	1990.12	512	20(2.16	1/2+
1377.3* 4	0.23 5	4439.88		3062.16	1/2
1387.64	0.21 5	1454.84	7/2	67.41	5/2
1415.4 <i>3 10</i>	0.90 7	5144.98		1/29.63	3/2
~1454.20 23	0.41 3	1700 (2	2/2-	202.072	1/2-
1446./1 0	2.08 /	1/29.63	3/2	282.973	1/2
1454.80 <i>12</i>	0.876	1454.84	1/2	0.0	5/2
1488.0 3	0.34 0	2021 67	1/2-2/2-	1700 62	2/2-
1502.01 10	0.770	3231.07	1/2 ,3/2	1/29.63	3/2 5/2-
1530 1	0.01 8	5144.98	5/2-	1009.80	5/2 5/2-
1342.42 /	2.30 9	1009.80	3/2 2/2-	0/.41	3/2 2/2-
1380.03 20	0.400	2703.03	$\frac{3}{2}$	1185.501	5/2 1/2-
130/.// 23 X1601 0 4	0.480	5/11.49	1/2 ,3/2	2123.949	1/2
1610 1	0.23 8	1600 00	5/2-	0.0	2/2-
1010 1	2.04 9	2021 67	$\frac{3}{2}$	0.0	5/2-
1021.80 ð	2.02 9	3231.07	$\frac{1}{2}, \frac{3}{2}$	1122 41	5/2 5/2-
1033.08 20 X1645.0 2	0.709	2703.03	3/2	1132.41	3/2
1043.0 3	0.33 0	1720 62	2/2-	67 11	5/2-
1002 1	2.13 /	1/29.03	3/2 2/2-	0/.41	3/2 2/2-
1005 1	0.92 0	2703.03	5/2	1099.084	3/2

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$\gamma(^{61}\text{Ni})$ (continued)

Continued on next page (footnotes at end of table)

61 NI	- 1
28111	33-4

60 Ni(n γ) (nol n γ) E=thermal	2004Ra23 1993Ha05 1972Ko15 (continued)
1 ($(1, \gamma)$, (poi $1, \gamma) \ge -$ thermal	2004Ra25,1775Ha05,1772R015 (Continueu)

				γ (⁶¹ N	i) (continued)
Eγ	$I_{\gamma}^{\dagger h}$	E _i (level)	\mathbf{J}_i^π	E_f	J_f^{π}
1685.54 10 ×1716.46.25	1.13 7	3415.14	1/2-,3/2-	1729.63	3/2-
1710.40 25	0.26 7	5390.85		3668.99	1/2-,3/2-
1729.74 8	2.03 9	1729.63	3/2-	0.0	3/2-
1750.9 6	0.21 6	5955.52		4204.3	
1778 83 12	0.35 0	3776 80	$(1/2^{-} 3/2^{-})$	1008 12	5/2-
1795.61 24	0.50 7	3525.60	(1/2 ,5/2)	1729.63	$3/2^{-}$
^x 1819.7 6	0.25 7				-/-
1840.94 5	4.78 12	2123.949	1/2-	282.973	$1/2^{-}$
x1843.87 <i>17</i>	1.15 9	(7020 112)	1/0+	5055 50	
1864.55 18	0.80 8	(7820.113)	1/2 '	5955.52	3/2-
1077.14	0.39.8	1998 12	$\frac{1}{2}$ 5/2 ⁻	67.41	$5/2^{-}$
^x 1943.0 5	0.23 7	1770.12	5/2	07.11	5/2
1959.71 7	1.77 8	3144.98		1185.301	3/2-
1998.10 <i>11</i>	1.44 10	1998.12	5/2-	0.0	3/2-
2012.47 22	0.81 12	3144.98		1132.41	5/2-
2045.32.5	4.76 13	3144.98		1099.684	3/2
2085.7" 3 *2088.26.25	0.62 9	4793.12		2707.63	
x2093.10.21	0.81 9				
2099.27 7	3.34 10	3231.67	$1/2^{-}, 3/2^{-}$	1132.41	$5/2^{-}$
2108.99 18	1.12 10	2765.03	3/2-	656.039	1/2-
x2111.6 4	0.47 10	1000 54		0100.040	1/0-
2115.2 3	0.49 11	4239.76	1/2-	2123.949	$\frac{1}{2}$
x2125.90 5	143.0 13	2125.949	1/2	0.0	5/2
2207.0 3	0.86 14	2862.94	$1/2^{-}, 3/2^{-}$	656.039	$1/2^{-}$
2229.84 20	0.96 22	3415.14	1/2-,3/2-	1185.301	3/2-
2282.66 14	0.70 6	3415.14	1/2-,3/2-	1132.41	5/2-
^x 2301.3 4	0.28 6				
2300.5 5	0.24 0	3415 14	$1/2^{-} 3/2^{-}$	1099 684	3/2-
2340.56 22	0.46 6	3525.60	1/2 ,5/2	1185.301	$3/2^{-}$
^x 2347.5 4	0.28 6				- 1
2351.3 4	0.30 6	5116.61	1/2-,3/2-	2765.03	3/2-
2356.6 3	0.37 6	2639.51	1/2-,3/2-	282.973	1/2-
~2387.21 14	0.94 /	3062 16	1/2+	656 030	1/2-
2429.15 14	1.11 8	(7820.113)	1/2 $1/2^+$	5390.85	1/2
x2432.2 4	0.39 7	(, 0201110)	-/-	000000	
^x 2436.14 <i>13</i>	1.34 8				
x2455.5 6	0.21 6				
×2460.7 4	0.46 7				
2482.07.18	1 10 75	2765.03	3/2-	282,973	$1/2^{-}$
2483.6 7	0.32 14	3668.99	$1/2^{-}, 3/2^{-}$	1185.301	3/2-
2488.84 12	1.16 7	3144.98		656.039	1/2-
2510.0 [@] 3	0.53 7	4239.76		1729.63	3/2-
2575.63 14	0.89 7	3231.67	1/2-,3/2-	656.039	1/2-
2579.84 15	0.91 7	2862.94	$1/2^{-}, 3/2^{-}$	282.973	$1/2^{-}$
² 011./3 10 ^x 2620 7 5	0.35 8	3/11.49	1/2 ,3/2	1099.084	3/2
x2634.0 4	0.38 7				
2639.44 6	3.90 9	2639.51	1/2-,3/2-	0.0	3/2-

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⁶¹ ₂₈ Ni ₃₃ -	5
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⁶⁰ Ni(\mathbf{n},γ),(pol \mathbf{n},γ) E=thermal	2004Ra23,1993Ha05,1972Ko15 (continued)

				y	
E_{ν}	$I_{\gamma}^{\dagger h}$	E_i (level)	J^{π}_{i}	\mathbf{E}_{f}	J^{π}_{c}
2644.02.02	0.(1.7	277(00	$\frac{l}{(1/2-2/2-)}$	1122.41	J
2644.23 22	0.01 /	3776.80	(1/2, 3/2)	1132.41	$\frac{5}{2}$
2070.3 3	0.50 0	3770.80	(1/2 ,5/2)	1099.084	3/2 2/2-
x2608 22 22	0.31.8	3609.99		1165.501	5/2
2098.22 22	0.94 9	(7820, 113)	1/2+	5116.61	1/2-3/2-
2703.38 19	2 60 11	(7820.115)	1/2	0.0	$\frac{1}{2}, \frac{3}{2}$
2750 38 10	1 37 8	3415.14	$1/2^{-} 3/2^{-}$	656 030	$\frac{3}{2}$
2759.50 19	1.57 0	2765.03	$\frac{1}{2}, \frac{3}{2}$	0.0000000000000000000000000000000000000	$\frac{1}{2}$
x2771 4 7	0.25.8	2705.05	5/2	0.0	5/2
277894	0.44 8	3062.16	$1/2^{+}$	282,973	$1/2^{-}$
2783.80.9	2.41 10	(7820.113)	$1/2^+$	5036.24	1/2
2705.3°	0.47.8	2862.04	$1/2^{-} 3/2^{-}$	67.41	5/2-
2795.5 4	0.47 8	3711 40	$\frac{1}{2}, \frac{3}{2}$ $\frac{1}{2}, \frac{3}{2}$	07.41	5/2-
x2816.95 14	1 45 8	5711.77	1/2 ,5/2	200.57	5/2
x2823.07.16	1 18 9				
x2856.48 13	1.33 7				
2861.95 4	6.59 11	3144.98		282.973	$1/2^{-}$
x2903.0 7	0.27 11	011100		202070	-/-
^x 2914.5 7	0.25 8				
x2933.80 12	2.96 12				
^x 2947.5 7	0.25 7				
^x 2977.79 25	0.69 7				
^x 3000.2 5	0.36 8				
3012.66 11	2.89 10	3668.99	$1/2^{-}, 3/2^{-}$	656.039	$1/2^{-}$
3027.02 18	1.06 8	(7820.113)	$1/2^{+}$	4793.12	
3054.36 18	0.92 7	4239.76		1185.301	3/2-
3062.16 10	1.75 8	3062.16	1/2+	0.0	3/2-
3077.5 <i>3</i>	0.60 7	3144.98		67.41	5/2-
3082.21 21	0.78 8	3738.34	$(1/2^+)$	656.039	$1/2^{-}$
3104.6 8	0.47 15	4204.3		1099.684	3/2-
3106.8 4	1.30 16	4239.76		1132.41	5/2-
^x 3129.1 6	0.43 10				
3132.05 8	5.10 13	3415.14	$1/2^{-}, 3/2^{-}$	282.973	1/2-
3144.77	4.09 13	3144.98	1/0= 2/0=	0.0	3/2
3164.49 24	0.84 10	3231.67	1/2 ,3/2	67.41	5/2
~3180.8 4	0.50 11	2960.00		(5(020	1/0-
5215.9 5 2221 47 0	0.04 9	2021 67	1/2-2/2-	030.039	1/2
3231.47 9	2.30 9	3525.60	1/2 ,3/2	282 073	$\frac{3}{2}$
3254.8.6	0.28.8	4439.88		1185 301	$\frac{1}{2}$ $\frac{3}{2^{-}}$
3305 30 14	1.62.9	$(7820\ 113)$	$1/2^{+}$	4514 69	5/2
3328.6.6	0.35 8	4514.69	1/2	1185.301	$3/2^{-}$
3347.7.4	0.64 9	3415.14	$1/2^{-}.3/2^{-}$	67.41	$5/2^{-}$
x3359.5 3	0.38 9	0.1011.	1/2 ,0/2	0/111	0/=
^x 3369.1 4	0.53 8				
3380.29 21	2.38 23	(7820.113)	$1/2^{+}$	4439.88	
3382.3 7	0.80 21	4514.69		1132.41	5/2-
3385.92 5	9.23 13	3668.99	$1/2^{-}, 3/2^{-}$	282.973	$1/2^{-}$
^x 3391.6 3	0.70 9				
^x 3398.6 <i>3</i>	1.16 15				
3415.04 ^a 6	5.05 11	3415.14	1/2-,3/2-	0.0	3/2-
3525.1 9	0.20 7	3525.60		0.0	3/2-
3531.51 20	2.00 18	4439.88		908.59	5/2-
3580.18 7	9.8 3	(7820.113)	1/2+	4239.76	
3583.47 14	3.10 19	4239.76		656.039	1/2-
3601.8 4	0.64 12	3668.99	$1/2^{-}, 3/2^{-}$	67.41	5/2-

$\gamma(^{61}\text{Ni})$ (continued)

Continued on next page (footnotes at end of table)

⁶⁰ Ni(n, γ),(pol n, γ) E=thermal	2004Ra23,1993Ha05,1972Ko15 (continued)
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$ \begin{array}{c c c c c c c c c c c c c c c c c c c $					γ (⁶¹ Ni) (continued)	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	F	т † <i>h</i>	E.(laval)	īπ	F.	īπ
$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	Ľγ	lγ	$E_i(\text{level})$	J _i	Ľf	J _f
$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	3615.9 4	0.56 11	(7820.113)	$1/2^{+}$	4204.3	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	3640.99 18	1.95 16	(7820.113)	$1/2^{+}$	4178.90	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	3644.0 4	0.90 15	3711.49	$1/2^{-}, 3/2^{-}$	67.41	5/2-
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	*3687.24 21	3.00 25				- /a_
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	3709.3 5	1.2 3	3776.80	$(1/2^-, 3/2^-)$	67.41	5/2-
$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	3/11.42 11	6.8 3	3/11.49	1/2-,3/2-	0.0	3/2-
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	3850.7° 6	0.53 14	5036.24		1185.301	3/2-
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	3869.83 12	3.81 22	3869.99		0.0	3/2-
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	3949.97 9	5.61 23	(7820.113)	$1/2^{+}$	3869.99	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	*3974.37 22	1.39 13				
408.6.5 1.64 15 (7820.113) $1/2^+$ 3738.34 $(1/2^+)$ 4108.52.8 10.5.3 (7820.113) $1/2^+$ 3711.49 $1/2^-, 3/2^-$ 4150.92.6 11.8.4 (7820.113) $1/2^+$ 3668.99 $1/2^-, 3/2^-$ 4171.7.6 0.45.12 4239.76 67.41 $5/2^-$ 4225.9.8 0.59.18 5955.52 1729.63 $3/2^-$ *4238.669 5.43.24 4239.76 0.0 $3/2^-$ *4284.0 6 0.25.9 4239.76 0.0 $3/2^-$ *4404.82.5 16.2.4 (7820.113) $1/2^+$ 3415.14 $1/2^-, 3/2^-$ 4439.24 0.83 12 4514.69 0.0 $3/2^-$ 4514.64 0.83 12 4514.69 0.0 $3/2^-$ 4588.26 11.7.3 (7820.113) $1/2^+$ 3231.67 $1/2^-, 3/2^-$ 4573.0.6 0.72 15 5036.24 282.973 $1/2^-$ 4753.0.6 0.72 15 5036.24 282.973 $1/2^-$ 4753.0.6 0.72 15 5036.24 282.973 $1/2^-$	4043.33 14	2.66 18	(7820.113)	1/2+	3776.80	$(1/2^{-},3/2^{-})$
4108.52 8 10.5 3 (7820.113) 1/2' 3/11.49 1/2', 3/2' 4111.5 4 1.05 19 4178.90 67.41 5/2'' 4150.92 6 11.8 4 (7820.113) 1/2'' 3668.99 1/2'', 3/2'' 4225.9 8 0.59 18 5955.52 1729.63 3/2'' *4228.6 7 0.75 18 4239.76 0.0 3/2'' *4284.0 6 0.25 9	4081.6 3	1.64 15	(7820.113)	1/2	3738.34	$(1/2^+)$
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	4108.52 8	10.5 3	(7820.113)	1/21	3711.49	$\frac{1}{2}, \frac{3}{2}$
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	4111.5 4	1.05 19	41/8.90	1/0+	67.41	5/2
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	4150.92 0	11.8 4	(7820.115)	1/2	5008.99	$\frac{1}{2}, \frac{3}{2}$
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	41/1./ 0	0.43 12 0.50 18	4239.70		07.41	$\frac{3}{2}$
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	4223.9 0 X4228.6 7	0.39 18	5955.52		1729.03	5/2
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	4228.07	5.43.24	4239 76		0.0	3/2-
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$x_{4284.0.6}$	0 25 9	4237.10		0.0	5/2
4404.82 516.2 4(7820.113) $1/2^+$ 3415.14 $1/2^-, 3/2^-$ 4439.2 40.83 124439.880.0 $3/2^-$ 4514.6 40.83 124514.690.0 $3/2^-$ 4588.26 611.7 3(7820.113) $1/2^+$ 3231.67 $1/2^-, 3/2^-$ 4675.05 520.3 3(7820.113) $1/2^+$ 3144.98*4714.2 70.49 1373145.14 $1/2^-, 3/2^-$ 4757.86 104.98 25(7820.113) $1/2^+$ 3062.16 $1/2^+$ 4793.2 70.51 134793.120.0 $3/2^-$ *4818.8 40.89 1444444833.2 90.34 135116.61 $1/2^-, 3/2^-$ 282.973 $1/2^-$ 4957.1 42.2 3(7820.113) $1/2^+$ 2862.94 $1/2^-, 3/2^-$ 5055.02 124.22 20(7820.113) $1/2^+$ 2707.635180.36 93.93 14(7820.113) $1/2^+$ 2639.51 $1/2^-, 3/2^-$ 5055.22 70.73 125390.8567.41 $5/2^-$ 5180.36 93.93 14(7820.113) $1/2^+$ 2123.949 $1/2^-$ 5955.3 80.41 125955.520.0 $3/2^-$ 6090.5 50.72 12(7820.113) $1/2^+$ 1729.63 $3/2^-$ *6105.8 40.33 136575.70282.973 $1/2^-$ 6634.40d 529.5 4(7820.113) $1/2^+$ 1099.684 $3/2^-$ *6105.8 40.33 136575.70282.973 $1/2^-$ *613.9 51.3 3(7	4294.44 15	1.99 13	(7820.113)	$1/2^{+}$	3525.60	
4439.2 4 0.83 12 4439.88 0.0 $3/2^-$ 4514.6 4 0.83 12 4514.69 0.0 $3/2^-$ 4588.26 6 11.7 3 (7820.113) $1/2^+$ 321.67 $1/2^-, 3/2^-$ 4675.05 5 20.3 3 (7820.113) $1/2^+$ 3144.98 $^*4714.2$ 7 0.49 13 $^*4753.0$ 6 0.72 15 5036.24 282.973 $1/2^ 4757.86$ 10 4.98 25 (7820.113) $1/2^+$ 3062.16 $1/2^+$ 4793.2 7 0.51 13 4793.12 0.0 $3/2^ ^*4818.8$ 4 0.89 14 4833.2 9 0.34 13 5116.61 $1/2^-, 3/2^ 282.973$ $1/2^ 4957.1$ 4 2.2 3 (7820.113) $1/2^+$ 2765.03 $3/2^ 5112.1$ 5 0.84 13 (7820.113) $1/2^+$ 2765.03 $3/2^ 5180.36$ 9 3.93 14 (7820.113) $1/2^+$ 2765.03 $3/2^ 5180.36$ 9 3.93 14 (7820.113) $1/2^+$ 2123.949 $1/2^ 5695.86^c$ 4 <td>4404.82.5</td> <td>16.2 4</td> <td>(7820.113)</td> <td>$1/2^+$</td> <td>3415.14</td> <td>$1/2^{-}.3/2^{-}$</td>	4404.82.5	16.2 4	(7820.113)	$1/2^+$	3415.14	$1/2^{-}.3/2^{-}$
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	4439.2 4	0.83 12	4439.88	-, -	0.0	3/2-
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	4514.6 4	0.83 12	4514.69		0.0	3/2-
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	4588.26 6	11.7 <i>3</i>	(7820.113)	$1/2^{+}$	3231.67	$1/2^{-}, 3/2^{-}$
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	4675.05 5	20.3 <i>3</i>	(7820.113)	$1/2^{+}$	3144.98	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	^x 4714.2 7	0.49 13				
4757.86104.9825(7820.113) $1/2^+$ 3062.16 $1/2^+$ 4793.270.51134793.120.0 $3/2^-$ *4818.840.89144833.290.34135116.61 $1/2^-, 3/2^-$ 282.973 $1/2^-$ 4957.142.23(7820.113) $1/2^+$ 2862.94 $1/2^-, 3/2^-$ 5055.02124.2220(7820.113) $1/2^+$ 2765.03 $3/2^-$ 5112.150.8413(7820.113) $1/2^+$ 2707.635180.3693.9314(7820.113) $1/2^+$ 2639.51 $1/2^-, 3/2^-$ 5322.270.73125390.8567.41 $5/2^-$ 5515.470.45126615.81099.684 $3/2^-$ 5695.8641573(7820.113) $1/2^+$ 2123.949 $1/2^-$ 5955.380.41125955.520.0 $3/2^-$ 6090.550.7212(7820.113) $1/2^+$ 1729.63 $3/2^-$ *6105.840.33136292.370.53136575.70282.973 $1/2^-$ 6634.40d529.54(7820.113) $1/2^+$ 1099.684 $3/2^-$ 7163.951.33(7820.113) $1/2^+$ 1099.684 $3/2^-$ 7163.951.33(7820.113) $1/2^+$ 282.973 $1/2^-$ 756.626705 </td <td>4753.0 6</td> <td>0.72 15</td> <td>5036.24</td> <td></td> <td>282.973</td> <td>1/2-</td>	4753.0 6	0.72 15	5036.24		282.973	1/2-
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	4757.86 10	4.98 25	(7820.113)	$1/2^{+}$	3062.16	$1/2^{+}$
4 4818.8 4 0.89 14 4 4833.2 9 0.34 13 5116.61 $^{1/2^-}$, $^{3/2^-}$ 282.973 $^{1/2^-}$ 4 957.1 4 2.2 3 (7820.113) $^{1/2^+}$ 2862.94 $^{1/2^-}$, $^{3/2^-}$ 5055.02 12 4.22 20 (7820.113) $^{1/2^+}$ 2765.03 $^{3/2^-}$ 5112.1 5 0.84 13 (7820.113) $^{1/2^+}$ 2707.63 5180.36 9 3.93 14 (7820.113) $^{1/2^+}$ 2639.51 $^{1/2^-}$, $^{3/2^-}$ 5322.2 7 0.73 12 5390.85 67.41 $^{5/2^-}$ 5515.4 7 0.45 12 6615.8 1099.684 $^{3/2^-}$ 5695.86 ^c 4 157 3 (7820.113) $^{1/2^+}$ 2123.949 $^{1/2^-}$ 5955.3 8 0.41 12 5955.52 0.0 $^{3/2^-}$ 6090.5 5 0.72 12 (7820.113) $^{1/2^+}$ 1729.63 $^{3/2^-}$ $^*6105.8 4$ 0.33 13 6275.70 282.973 $^{1/2^-}$ $^{c}634.40^d$ 5 29.5 4 (7820.113) $^{1/2^+}$ 1099.684 $^{3/2^-}$ $^*6105.9 5$ 1	4793.2 7	0.51 13	4793.12		0.0	3/2-
4833.2 9 0.34 13 5116.61 $1/2^-, 3/2^-$ 282.973 $1/2^-$ 4957.1 4 2.2 3 (7820.113) $1/2^+$ 2862.94 $1/2^-, 3/2^-$ 5055.02 12 4.22 20 (7820.113) $1/2^+$ 2765.03 $3/2^-$ 5112.1 5 0.84 13 (7820.113) $1/2^+$ 2639.51 $1/2^-, 3/2^-$ 5322.2 7 0.73 12 5390.85 67.41 $5/2^-$ 5515.4 7 0.45 12 6615.8 1099.684 $3/2^-$ 5695.86 ^c 4 157 3 (7820.113) $1/2^+$ 2123.949 $1/2^-$ 5955.3 8 0.41 12 5955.52 0.0 $3/2^-$ 6090.5 5 0.72 12 (7820.113) $1/2^+$ 1729.63 $3/2^-$ *6105.8 4 0.33 13 6575.70 282.973 $1/2^-$ 6634.40 ^d 5 29.5 4 (7820.113) $1/2^+$ 1099.684 $3/2^-$ *6105.8 5 0.72 12 (7820.113) $1/2^+$ 1099.684 $3/2^-$ *6105.8 4 0.33 13 6292.3 7 0.53 13 6575.70 282.973 $1/2^-$	^x 4818.8 4	0.89 14				
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	4833.2 9	0.34 13	5116.61	$1/2^{-}, 3/2^{-}$	282.973	1/2-
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	4957.14	2.2.3	(7820.113)	1/2	2862.94	1/2 ,3/2
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	5055.02 12	4.22 20	(7820.113)	1/2	2765.03	3/2
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	5112.1 5	0.84 13	(7820.113)	$1/2^+$	2/07.03	1/0- 2/0-
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	5322 2 7	5.95 14 0 73 12	(7820.115)	1/2	2039.31	$\frac{1}{2}, \frac{3}{2}$
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	5515 4 7	0.75 12 0.45 12	6615.8		1000 684	$\frac{3}{2}$
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	5695 86 ^C 4	157.3	(7820, 113)	$1/2^{+}$	2123 949	$\frac{3}{2}$
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	5955 3 8	0.41 12	5955 52	1/2	0.0	$\frac{1}{2}$ $\frac{3}{2^{-}}$
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	6090.5.5	0.72 12	(7820.113)	$1/2^{+}$	1729.63	$3/2^{-}$
	^x 6105.8 4	0.33 13	(7020.110)	1/2	1729.00	5/2
$ \begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrr$	6292.3 7	0.53 13	6575.70		282.973	$1/2^{-}$
6719.97^{e} 5 55.8 7 (7820.113) $1/2^{+}$ 1099.684 $3/2^{-}$ 7163.9 5 1.3 (7820.113) $1/2^{+}$ 656.039 $1/2^{-}$ 7536.62^{f} 6 705 9 (7820.113) $1/2^{+}$ 282.973 $1/2^{-}$ 7819.56^{g} 6 1236 15 (7820.113) $1/2^{+}$ 0.0 $3/2^{-}$	6634 40 ^d 5	29 5 4	(7820 113)	1/2+	1185 301	3/2-
7163.95 1.33 (7820.113) $1/2^+$ 656.039 $1/2^ 7536.62^f$ 6 7059 (7820.113) $1/2^+$ 282.973 $1/2^ 7819.56^8$ 6 1236 15 (7820.113) $1/2^+$ 0.0 $3/2^-$	6719.97 ^e 5	55.8 7	(7820.113)	$1/2^+$	1099.684	3/2-
7536.62^{f} 6 705.9 (7820.113) $1/2^{+}$ 282.973 $1/2^{-}$ 7819.56^{8} 6 1236.15 (7820.113) $1/2^{+}$ 0.0 $3/2^{-}$	7163.9.5	1.3.3	(7820.113)	$1/2^+$	656.039	$1/2^{-}$
$7819.56^{8} 6$ 1236 15 (7820.113) $1/2^{+}$ 0.0 $3/2^{-}$	7536 62 f 6	705.9	(7820 113)	1/2+	282 973	$1/2^{-}$
	7819.56 ⁸ 6	1236 15	(7820.113)	$1/2^+$	0.0	3/2-

[†] Absolute cross sections (2004Ra23) are in millibarns.
[‡] Alternative placement:4240 ->2863.
[#] Alternative placement:5956 ->3870.

⁶⁰Ni(n,γ),(pol n,γ) E=thermal 2004Ra23,1993Ha05,1972Ko15 (continued)

$\gamma(^{61}\text{Ni})$ (continued)

[@] Alternative placement:3526 ->1015.

- [&] Alternative placement:4793 –>1998.
- ^{*a*} Alternative placement:4515 –>1100.
- ^b Alternative placement:6616 ->2765.
- ^c Circular polarization coefficient R=+0.92 8 (1972Ko15).
- ^d Circular polarization coefficient R=-1.0 4 (1972Ko15).
- ^e Circular polarization coefficient R=-0.6 2 (1972Ko15).
- ^f Circular polarization coefficient R=+1.05 3 (1972Ko15).
- ^g Circular polarization coefficient R=-0.48 2 (1972Ko15).
- ^h For intensity per 100 neutron captures, multiply by 0.0427.

 $x \gamma$ ray not placed in level scheme.



$^{61}_{28}\rm{Ni}_{33}$

8



⁶¹₂₈Ni₃₃





10

⁶¹₂₈Ni₃₃-10





 $^{61}_{28}\mathrm{Ni}_{33}$

11

⁶¹₂₈Ni₃₃-11



 $^{61}_{28}{
m Ni}_{33}$